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HIGH INTEGRATION ELECTRONIC ASSEMBLY AND METHOD

Field of the Invention

The present invention relates to an automotive anti-lock braking system and, more particularly, to a connector assembly for use with the automotive anti-lock braking system.

Background of the Invention

A conventional anti-lock braking system integrates an electronic control assembly with the braking system's motor connector and main hydraulic control connector. The conventional main connector has a solenoid valve assembly press-fit onto valve stems in a separate hydraulic control unit. This assembly is, in turn, connected to an electronic controller via a wiring harness.

Typically, pins on the motor connector and main connector are mechanically fixed for alignment, set

into position on one side of a circuit board, inserted into apertures on the one side of the circuit board, and then the distal ends of the pins are soldered directly to the other side of the circuit board of the electronic control assembly to electrically and mechanically secure them in place on the electronic control assembly.

An electronic control assembly that takes up less space while meeting all of the functional requirements of a conventional anti-lock braking system would beneficially reduce the space taken up by the entire anti-lock braking system.

Summary of the Invention

In accordance with one feature of the present invention, an assembly comprises a circuit board, a first component, and a second component. The circuit board has a planar first surface and a planar second surface opposite the first surface. The first component has a first set of connectors. The first set of connectors engages a corresponding set of apertures in the first surface of the circuit board. The second component has a second set of mechanical one-way connectors. The second set of connectors engages a corresponding set of apertures in the second surface of

the circuit board. The circuit board further has a normal axis perpendicular to both the first and second surfaces. The normal axis passes through both the first and second components.

In accordance with another feature of the present invention, an assembly is used with an anti-lock braking system. The assembly comprises a circuit board, a first component, and a second component. The circuit board has a first surface, a second surface opposite the first surface, and a plurality of electrical engagement holes. The holes are located at the first surface and the second surface. The first component has a first set of connectors. The first set of connectors engages a first set of the plurality of holes at the first surface. The second component has a second set of mechanical one-way connectors. The second set of connectors engages a second set of the plurality of holes at the second surface. The circuit board has a normal axis perpendicular to both the first and the second surfaces. The normal axis passes through the first component and the second component.

In accordance with still another feature of the present invention, an assembly is used with an anti-lock braking system. The assembly comprises a

circuit board means, a first connecting means, and a second connecting means. The circuit board means provides electrical connection and support to a first component and a second component. The circuit board means has a first surface and a second surface opposite the first surface. The first connecting means connects the first component to the first surface of the circuit board means. The second connecting means connects the second component to the second surface of the circuit board means. The circuit board means has a normal axis perpendicular to both the first and the second surfaces. The normal axis passes through both the first component and the second component.

In accordance with yet another feature of the present invention, a method secures electric components of an anti-lock braking system. The method comprises the steps of mounting a first component to a first surface of a circuit board for electrically engaging the circuit board, and mounting a second component to a second surface of the circuit board for electrically engaging the circuit board. The mounting of the first component includes the step of inserting at least one mechanical one-way connector into a first side of the circuit board. The mounting of the second component

includes the step of inserting at least one mechanical one-way connector into a second side of the circuit board such that at least one of the connectors extends from the first component toward the second component and at least one other of the connectors extends from the second component toward the first component.

Brief Description of the Drawings

The foregoing and other features and advantages of the present invention will become more apparent to one skilled in the art upon consideration of the following description of the invention and the accompanying drawings, in which:

Fig. 1 is a schematic view of an assembly in accordance with the present invention;

Fig. 2 is a schematic section view taken along line 2-2 in Fig. 1; and

Fig. 3 is a schematic section view taken along line 3-3 in Fig. 1.

Description of an Example Embodiment

In one example in accordance with the present invention, an anti-lock braking system 10 includes an integrated electronic assembly 20. The assembly 20 comprises a printed circuit board 30, a first component 40, a second component 50, a third

component 60, a fourth component 70, and a fifth component 80. The first component 40 may be a main connector for the anti-lock braking system 10. The second component 50 may be a motor connector for the anti-lock braking system 10. The third, fourth, and fifth components 60, 70, 80 may be other components for the anti-lock braking system 10.

The circuit board 30 has a planar first surface 32 and a planar second surface 34 opposite the first surface. The first component 40 has a first set of mechanical one-way connectors 42, such as non-soldered compliant pins. The first set of connectors 42 engages a corresponding set of apertures, or engagement holes 36, in the first surface 32 of the circuit board 30. The second component 50 has a second set of mechanical one-way connectors 52, such as non-soldered compliant pins. The second set of connectors 52 engages a corresponding set of apertures, or engagement holes 38, in the second surface 34 of the circuit board 30. The use of non-soldered connectors allows both sides of the circuit board 30 to electrically and mechanically secure components to the circuit board 30 since the reverse sides of the circuit board do not

require access for a securing process such as soldering.

The circuit board 30 further has a normal axis 39 perpendicular to both the first and second surfaces 32, 34. The normal axis 39 passes through both the first and second components 40, 50. The circuit board 30 thereby provides means for electrical connection and support to the first component 40 and the second component 50.

As viewed in Figs. 1 and 2, the first set of connectors 42 may be interposed between the second set of connectors 52 such that the first component 40 and the second component 50 may overlay each other, as viewed in Fig. 1. This arrangement may allow the circuit board 30 to be up to half the size of a circuit board utilizing the conventional arrangement (i.e., one sided mounting).

As viewed in Figs. 1 and 3, the mounting of the third component 60 and fifth component 80 on the first surface 32 of the circuit board 30 and the fourth component 70 on the second surface 34 of the circuit board allows greater access to the components than the conventional arrangement, even though the third,

fourth, and fifth components 60, 70, 80 do not overlay each other.

The third component 60 has a third set of connectors 62, such as non-soldered compliant pins or solderable pins. The fourth component 70 has a fourth set of connectors 72, such as non-soldered compliant pins or solderable pins. The fifth component 80 has a fifth set of connectors 82, such as non-soldered compliant pins or solderable pins.

A hybrid arrangement of both solderable pins and compliant pins may be used with the assembly 20. As viewed in Fig. 3, for example, the fourth component 70 may have solderable pins and may be mounted to the second surface 34 of the circuit board 30 and secured to the circuit board by solder 74 on the first surface 32. Subsequently, the third and fifth components 60, 80 may be secured to the first surface 32 of the circuit board 30 with compliant pins. Since the compliant pins plastically deform for securing to the circuit board 30, no access to the second surface 34 is necessary when mounting the third component 60 and the fifth component 80 to the first surface 32 of the circuit board. A circuit board 30 with equal capability and smaller size than the

conventional circuit board is still produced. This hybrid arrangement may also be used with the interposed pins 42, 52 of the first and second components 40, 50 (Fig. 2) for even greater utilization of space on the circuit board 30.

In accordance with another feature of the present invention, a method secures the first and second components 40, 50 of the anti-lock braking system 10. The method comprises the steps of: mounting the first component 40 to the first surface 32 of the circuit board 30 for electrically engaging the circuit board; and mounting the second component 50 to the second surface 34 of the circuit board for electrically engaging the circuit board. The mounting of the first component 40 includes the step of inserting at least one mechanical one-way connector 42 into the first surface 32 of the circuit board 30. The mounting of the second component 50 includes the step of inserting at least one mechanical one-way connector 52 into the second surface 34 of the circuit board 30 such that at least one of the connectors 42 extends from the first component 40 toward the second component and at least one other of the connectors 52 extends from the second component toward the first component.

From the above description of the invention, those skilled in the art will perceive improvements, changes and modifications. Such improvements, changes and modifications within the skill of the art are intended to be covered by the appended claims.